

# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 20. AUGUST 1899.

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V.—*Notes on the Mollusca of the Arabian Sea, Persian Gulf, and Gulf of Oman, mostly dredged by Mr. F. W. Townsend, with Descriptions of Twenty-seven Species.* By JAMES COSMO MELVILL, M.A., F.L.S., &c.

[Plates I. & II.]

THE present paper constitutes the third of a series\* written to further the elucidation of the large molluscan collections gathered from time to time during the past seven or eight years by Mr. F. W. Townsend, of the Indo-European Telegraph Service, mainly amongst the islands and bays of the Persian Gulf and that portion of the Arabian Sea impinging on the Mekran coast of Beluchistan as far as Karachi. In the second of these papers † a full account of the methods employed in dredging and of the area traversed, with sundry other particulars, is given; but it seems unnecessary to reproduce here any of these details, to which I would simply refer any who may be interested in the narration. Suffice to say that I hope some day to be able to prepare as complete a catalogue as possible of these collections, the

\* Cf. Mem. Lit. & Phil. Soc. Manch. vol. xli. pt. 3, 1896-97, pp. 1-26; vol. xlii. pt. 2, 1897-98, pp. 1-39.

† L. c. pp. 3-7.

individual species already noted numbering about 1100, speaking roughly; and since labels have been carefully kept with each individual, stating the depth, locality, quality of ground, &c. at which found, I believe such a publication would be of much value to all who are interested in geographical distribution.

So little attention has been hitherto paid—not, indeed, until the last decade of this century—to the productions of the very extensive and prolific area having Bushire for its western and Karachi for its eastern limit, that it is hardly surprising to find what a wealth of hitherto unrevealed forms has been brought to light through Mr. Townsend's unremitting exertions, ably supported as he is by many of those with whom he is officially connected (*e. g.* Mr. B. T. Finch, C.I.E., Director in Chief of the Telegraph Department, Captain Tindall, of the S.S. 'Patrick Stewart,' and Mr. J. A. O'Maley), even though it has as yet been found impossible to exceed the 100-fathom limit, or, in fact, quite to attain it in dredging, and therefore no specialized abyssal forms have been received which would at all compare, for instance, with the results of the cruise of the 'Investigator' in the Bay of Bengal.

But, notwithstanding this, the results so far have been more than gratifying. About ten per cent. of the total number catalogued are new to science; these, with the exception of eight or ten differentiated by Mr. G. B. Sowerby\*, have been all described by myself in the two papers already referred to, and the addition of the following twenty-seven will swell the total to more than a hundred new forms.

When, in 1893-96, at first in conjunction with Mr. A. Abercrombie, I drew up lists of Bombay marine mollusca, of which no less than fifty-two had to be described, I expressed a strong opinion that this fauna was highly specialized and the number of endemic forms unusually great. How within so few years this conviction has become utterly falsified may best be inferred from the fact that of the fifty-two species no less than thirty-one have been found to occur in the Townsend collection †, mostly dredged near Karachi and the coast of Beluchistan, thus tending to prove that while certain forms may be confined to the North Indian Ocean, their range is wide there, and they mostly occur plentifully if locally.

I would particularly draw attention, among the Pelecypoda

\* Proc. Mal. Soc. Lond. i. pp. 214 & 278 *sqq.*

† A new figure of one of these, *Cerithiopsis (Seila) bandorensis*, Melv., being necessary, it is here given (Pl. I. fig. 12).

described in this paper, to a *Mastrinula*, a *Lucina*, and *Cryptodon victorialis*, all three of unusual delicacy. In Gastropoda a fine *Fusus*, two *Mitræ*, a beautiful *Natica*, and a *Lacuna*, the second of a northern genus to be described from tropical seas, are, perhaps, the most noteworthy. But there still are more Pleurotomidæ in proportion to other orders represented; indeed it is both curious and deeply interesting to observe how much that is fresh this highly organized assemblage of mollusks continues yearly to afford from all parts of the world and at all depths. One of our greatest desiderata is, and I fear may long continue to be, an up-to-date monograph of this group, fossil as well as recent, for it seems to me that certain *Drillieæ*, *Clathurellæ*, and *Mangiliæ*, especially, of the Tertiary formation run very close to, if they are not absolutely identical with, similar existing forms.

*Fusus Townsendi*, sp. n. (Pl. II. fig. 1.)

*F. testa* eleganter fusiformi, usque apicem rapide attenuata, cinerea, rufo-vel brunneo-purpureo suffusa; anfractibus 11, duobus apicalibus globulosis, vitrificatis, ochraceis vel brunneis inclusis, cæteris apud suturas multum impressis, longitudinaliter costatis, costis fortibus, crassis, ad medium acuticarinatis, et fusco-pictis, ultimo in anfractu ad numerum novem, superficie tota spiraliter arcte filo-lirata, ad medium anfractuum perforti, interstitiis tenuiliratis; apertura oblonga, intus cinerea, striata; canali perlongo (ad 32 mm.), arcte lirato usque ad basim; labio tenui; columella nitida, paululum reflexa.

Long. 80, lat. 24 mm. (sp. maj.).

„ 60, „ 19 „ (sp. min.).

*Hab.* Persian Gulf, dredged at 10–12 fathoms, in sand and mud, off Gais (or Kais), Hinderabi, and Sheik Shuaib Isles.

A fine species, with a resemblance to *F. tuberculatus*, Lamk., or *toreuma*, Mart., in miniature. Many examples were forwarded by Mr. Townsend, nearly all, even the most juvenile, covered, especially towards the apex, with *Lepralia*. Unlike *tuberculatus*, the dark coloration is on the ribs, not at the interstices. The colour varies from ochreous or stramineous to purplish brown on a grey ground; the whorls are eleven in number, two being apical and glassy brown, the rest are very strongly ribbed, all acutely angled in the middle of each whorl, the ribs showing here most prominently, with narrow white spaces surrounded by a dark brown coloration. The spiral liræ are very close and fine. Canal much produced; aperture oblong; mouth greyish within and

spirally striate. Outer lip thin. Columella shining, somewhat reflexed.

About twelve examples, all similar excepting in coloration.

Named in honour of the discoverer, Mr. Frederick W. Townsend, of Manora, Karachi.

*Nassa (Hima) ischna* \*, sp. n. (Pl. I. fig. 1.)

*N.* testa parva, multum attenuata, apice acutissimo, cinereo-alba, laete infra suturas et ad medium anfractus ultimi (interdum inter costas solum, interdum undique) brunneo-fasciata; anfractibus  $9\frac{1}{2}$ , quorum  $2\frac{1}{2}$  apicales albi, vitrei, cæteris longitudinaliter costatis, costis corrugatis, apud ultimum in numero tredecim, undique spiraliter liratis, ad costarum juncturam gemmuliferis; labro extus albo, incrassato, intus denticulato; columella alba, nitida, haud multum incrassata.

Long. 10, lat. 4 mm.

*Hab.* Persian Gulf, near Muscat.

A small but very striking *Nassa*, extremely attenuate and acuminate, ashy white, brightly banded just below the sutures and in the centre of the last whorl with brown, this sometimes only appearing in the interstices between the ribs, in other examples on the ribs as well, uniformly. The ribs are roughened with the gemmæ which appear at the point of juncture with the spiral liræ. On the last whorl there are about thirteen ribs. The whorls are about nine and a half; of these the apical are white, glassy, and shining. The aperture is ovate; outer lip white, shining, thickened, within denticulate; columella only slightly thickened, white, shining.

There seems much in common, save for form, between this species and *N. mammillifera* †, Melv., also from the Persian Gulf, which I originally designated as belonging to the subgenus *Niotha*, Ad. I should now be disposed to place both these forms in *Hima*, Leach. These subdivisions are in some instances quite misleading, and I have found occasionally a species that might almost equally well belong to two or three of them. *Niotha* is characterized as differing from *Hima* in three salient particulars:—

- (a) In short as against elevated spire.
- (b) Very large callus, compared with a callus only “defined.”
- (c) Outer lip with no, as opposed to a conspicuous marginal, varix.

A few examples, in fine condition, occurred.

\* ἰσχνος, thin, attenuate.

† Mem. Lit. & Phil. Soc. Manch. vol. xli. pt. 3, p. 4 (1896-97).

*Drillia theoreta* \*, sp. n. (Pl. I. fig. 2.)

*D.* testa mediocri, eleganter fusiformi, albo-purpurascente; anfractibus  $10\frac{1}{2}$ , quorum apicales  $1\frac{1}{2}$  vitrei, globosi, læves, cæteris fortiter et longitudinaliter rotundi-costatis, costis ultimum ad anfractum in numero decem, undique spiraliter arcute filo-liratis, superficie ad suturas brunneo maculata et hic illic ad liras eodem colore sparsa; apertura ovato-oblonga, intus purpureo-fusca, vel, interdum, albescente; labre haud multum incrassato, sinu excavato, lato; columella recta; canali breviter producto.

Long. 22, lat. 6 mm. (sp. maj.).

„ 15, „ 4.50 mm. (sp. min., forma albescens).

*Hab.* Henjam Island, Persian Gulf, 20–25 fathoms, and Sheik Shuaib Island, one large form.

Several examples. An attractive form, showing no variation in sculpture, but some in coloration and size. The albino variety is smaller and unicolorous, being of a pale ochreous externally, with white aperture; the normal state exhibits a purplish suffusion both externally and within, and scattered dots and maculations along the spiral liræ which surround the shell, especially prominent on the ribs of the last whorl. The whorls in all are ten to eleven, the apical being glassy and globular, the remainder are strongly longitudinally ribbed, the ribs numbering ten round the last whorl. The aperture is ovate-oblong, within purplish fuscous, in the normal examples; lip not much thickened, sinus wide, columella straight, canal shortly produced.

*Mangilia chilosema* †, sp. n. (Pl. I. fig. 3.)

*M.* testa parva, turrata, albo-straminea; anfractibus septem, quorum tribus apicalibus subvitreis, delicate sub lente striatulis, cæteris quatuor ventricosulis, apud suturas multum impressis, longitudinaliter rotundi-costatis, costis ultimo in anfractu ad undecim, undique spiraliter rudi-liratis, ad suturas et apud anfractus ultimi medium rubro-sparsis et interrupte zonatis, dorsaliter ad medium labri conspicue rubro-maculato; apertura oblonga, intus unimaculata; labro crassiusculo; sinu lato, conspicuo; columella recta; canali truncato.

Long. 6, lat. 2 mm.

*Hab.* Karachi and along the Mekran coast; abundant in certain localities.

Shell small, turreted, whitish straw-colour; whorls seven, inclusive of the three vitreous, obscurely delicately striate,

\* *θεώρητος*, conspicuous.

† *χείλος*, lip, and *σημμι*, mark.

apical, the remaining four being somewhat tumid, much impressed suturally, and longitudinally roundly ribbed; ribs eleven in number on the last whorl, the whole surface being spirally coarsely lirate; often in young specimens a gemmuled appearance is noticeable on the ribs at the point of junction with these spiral liræ, but this soon wears off. At the sutures and at the centre of the last whorl are observable red dashes and spots and a very obscure and interrupted deep red band; there is one very conspicuous and characteristic deep red spot just behind the outer lip, this being reflected within the aperture, which is oval-oblong, the outer lip being somewhat thickened, with broad and conspicuous sinus; columella straight and canal somewhat truncate.

Allied to the New Caledonian species *M. himerta* and *himerodes*, Melv. & Standen, from both of which it differs more in form than in coloration, the characteristic dorsal red spot being present in all three. In our catalogue of Madras Mollusca, Mr. Standen and I referred to this species as *M. Horneana*, Smith \*, an almost equally abundant mollusk in these seas with apparently identical distribution.

*Mangilia galigensis*, sp. n. (Pl. I. fig. 4.)

*M. testa* attenuato-fusiformi, perelongata, rufo-brunnea; anfractibus novem, quorum apicali vitreo, tribus huic approximatis rufis, unicoloribus, cæteris apud suturas compressis, ventricosulis, longitudinaliter forticostatis, costis perpaucis, in ultimo septem, costis infra, juxta suturas, albescens, ad medium subangulatis, superficie spiraliter delicatissime striata, eleganter vittata, albis zonis cum rufis alternata; apertura elongata; labro incrassato, nitido, perlævi, intus nigro-rufescente, extus albo-rufo vittato; canali breviter prolongata.

Long. 14·50, lat. 4 mm.

*Hab.* Galig Island.

The nearest, in fact the only close ally to this very beautiful form is *M. Townsendi*, Sowb. †, but the ribs are two or three fewer in number in each whorl and the colour is rufous, with no tinge of greenish; all the many examples of *M. Townsendi* I have seen are alike in both these particulars, being uniformly greenish olivaceous and many ribbed. The dimensions are about the same. I had at first thought of describing this as a varietal form only, but I defer to the opinion of two or three malacologists in keeping it distinct. *M. Townsendi* has not, so far as I am aware, been yet found

\* Journ. of Conch. vol. ix. p. 38.

† Proc. Mal. Soc. Lond. vol. i. p. 278 (1895)

in the Persian Gulf; it occurs, according to Mr. Townsend, from low-water mark to 5 fathoms on muddy sand off the Mekran coast of Beluchistan.

*Mangilia perlonga*, sp. n. (Pl. I. fig. 5.)

*M.* testa multum attenuata, fusiformi, solida; anfractibus octo, inclusis duobus apicalibus vitreis, perlævibus, nitidis, longitudinaliter fortiter paucicostatis, costis ultimi anfractus in numero septem, spiraliter rudi-liratis, et inter liras arctissime tenuistriatis, liris in anfractibus supernis tribus, in penultimo quatuor, in ultimo obscurioribus, sex vel septem; apertura ovata, labro crassiusculo, sinu perobsuro, columella recta, canali brevi.

Long. 7.50, lat. 2 mm.

*Hab.* Karachi.

A very attenuate species, fusiform, solid, eight-whorled, inclusive of the two glassy shining apical, longitudinally strongly ribbed; ribs few, being seven on the last whorl, crossed spirally with few intersecting liræ, and between these run many fine striations. The aperture is ovate, outer lip thickened, sinus very obscure, columella straight, canal short.

Allied in form to *M. fulvocincta*, Nevill, an Indian species, but more attenuate, and with only two, as against four, vitreous apical whorls. Dimensions about the same.

*Mangilia theskeloides* \*, sp. n. (Pl. I. fig. 6.)

*M.* testa fusiformi, versus apicem attenuata, solidiuscula; anfractibus septem, apicali (in nostris speciminibus imperfecto) nigrescente, cæteris turritis, ventricosulis, læte ochraceis, apud suturas et ad medium anfractus ultimi inter costas brunneo-zonatis, et aliter superficie omni brunneo-ochraceo sparsim depicta, costis longitudinalibus fortibus spiraliter striatis, anfractu ultimo ad undecim; apertura angusta, oblonga; labro exteriori albo, incrassato, sinu perobsuro; columella recta, apud basim brunnescente.

Long. 8, lat. 4 mm. (sp. maj.).

*Hab.* Karachi.

Shell fusiform, attenuate towards the apex, somewhat solid, seven-whorled, the apical whorl imperfect in all the examples examined, tinged with blackish brown; the rest of the whorls are turreted, tumid, brightly ochraceous, ornamented with strong longitudinal ribs, which number eleven on the last whorl; these are crossed by spiral close striæ, which are not shown on older worn specimens. The most conspicuous feature is a series of darker blackish-brown zones,

\* *Theskeloides*, from the resemblance to *M. theskela*.

one just above the suture of each whorl and another in the centre of the lowest; these zones are interrupted and only appear between the ribs, the remainder of the surface being painted with light brown scattered dots and flames, a series of light spiral maculations just below the sutures being specially prominent. The aperture is narrow, oblong, the dark zone shows transversely across the interior. Outer lip incrassate, sinus very obscure. Columella straight, stained with brown at the base.

The three nearest species to this interesting *Mangilia* are, perhaps, *bella*, Reeve, *interrupta*, Reeve, and *theskela*, Melv. & Stand., all abundant at Lifu, the form being totally different, while in markings those of *bella* and *theskela* seem to be combined. Tryon, I may mention, unites the two former of these species; nothing could be more distinct in my opinion. I consider, too, that *M. thiasotes*, Melv. & Stand., from the Pacific Islands, comes under the same category, and cannot, as suggested recently by Mr. C. Hedley in the "Mollusca of Funafuti"\*, be a *Daphnella*.

*Clathurella O'Maleyi*, sp. n. (Pl. I. fig. 7.)

*C. testa* attenuato-fusiformi, delicata, nitida, carnea; anfractibus septem, quorum duo apicales pulchre et minutissime decussati et alveolati, cæteris ad suturas impressis, tumidulis, nitidis, longitudinaliter costatis, costis paucis, apud ultimum septem, spiraliter obscure liratis, liris ad juncturam costarum magis conspicuis; apertura oblonga; labro exterioro brunneo-tincto; columellarecta; canali producto.

Long. 10, lat. 3 mm.

*Hab.* "On shell-growth on telegraph-cable, 55 fathoms, in mud; lat. 25° 58' N., long. 57° 05' E." (Sea of Oman).—*F. W. T.*

A very delicate flesh-coloured shining Pleurotomid with oblong mouth and produced canal, seven-whorled, including two decussated apical whorls, much impressed at the sutures, longitudinally few-ribbed, there are but seven on the last whorl, and spirally obscurely lirate; the outer lip and base of the canal are tinged with brown.

I would place this species near *C. Robillardi*, Barclay, in spite of the prolonged canal. In many ways this section of the genus differs from typical *Clathurellæ*, but in the involved and chaotic condition of the nomenclature any arrangement is but tentative.

A few examples only, named in honour of Mr. Julian

\* Mem. Austral. Mus. iii. p. 476 (1899).

Adrian O'Maley, of the Indian Government Telegraph S.S. 'Patrick Stewart,' Karachi, who has much assisted Mr. Townsend in many of his investigations.

*Latirus (Peristernia) pagodæformis*, sp. n.  
(Pl. I. fig. 8.)

*L. testa attenuata, fusiformi, fusca, ad medium costarum albescente, deinde infra spiraliter fusco-zonata; anfractibus decem, quorum tres apicales pallide brunnei, vitrei, læves, cæteris tumidis, apud suturas multum impressis, longitudinaliter rotundicostatis, costis crassis, apud ultimum anfractum decem, undique spiraliter filoliratis, interstitiis arcte squamiferis; apertura ovata, intus cinerea vel pallidissime violacea; labro tenui, simplici; columella lævi, nitida, obscure et oblique quadriplicata; canali longo, paullum recurvirostri, brunneo-tincto.*

Long. 28, lat. 9.50 mm.

*Hab.* Adhering to the telegraph-cable at 20 fathoms, mud; lat. 25° N., long. 63° E.

The nearest congener of this shell is *L. (Peristernia) pulchellus*, Reeve, of which we have seven examples, as far as this region is concerned, from Ceylon, the Angrias Bank, west of Bombay, and likewise from Muscat, where Mr. Townsend has dredged it at 10 fathoms. This new form differs in its far more tumid whorls, pinched in and compressed at the sutures, and likewise in the long, recurved, and fuscous-tinged canal; the whole spire is far more attenuate, the proportion of the last whorl as breadth is to length being 8:15, while in *L. pulchellus* it is 15:22 in a normal-sized example. *L. pagodæformis* is ten-whorled, three being pale brown, glassy, and apical; the remaining seven are tumid, longitudinally thickly and roundly ribbed, and spirally lirate; colour fuscous-brown, whitish towards the middle of each whorl, where the ribs naturally are most prominent, and on the last whorl just below this runs an indistinct spiral zone of darker brown. The aperture is oval, coloured within cinereous or very pale violet, never carnation or crimson as in *pulchellus*; the outer lip is thin and normally simple, columella obscurely and obliquely four-plaited; canal long, recurved, suffused at the base with brown.

I may add that this species seems more distinct from *L. pulchellus* than does *L. nassoides*, Reeve, though perhaps the recurved canal of the latter may constitute a specific character. Both are figured in the Conch. Icon. vol. iv., *Turbinella*, figs. 65 & 71 (1847).

Two or three examples.

*Mitra (Pusia) Elizæ*, sp. n. (Pl. II. fig. 2.)

*M. testa* utrinque attenuata, fusiformi, solidula, albescente; anfractibus 10-11, apicali nitida, perlævi, cæteris gradatulis, apud suturas impressis, arcute longitudinaliter costatis, undique spiritaliter sulcatis, sulcis crebris, ultimo in anfractu 13, penultimo 4-5, ad juncturam costarum summam ochraceo-punctatis vel lineatis, interstitiis aliter lævibus; anfractibus superne juxta suturas, et in ultimo, apud medium fusco-cinctis, ad basim paullum nodulifero; apertura oblonga, fusciscente; labro recto, extus ad partem inferam crenulato; columella ochraceo-tincta, quadriplicata.

Long. 18, lat. 6.50 mm.

*Hab.* In coral-sand, dredged at 10 fathoms, Sheik Shuaib Island, Persian Gulf.

Two fine examples of a *Pusia* of elegant fusiform contour, attenuate at both ends, somewhat solid, white, ten- to eleven-whorled, the apical being shining, smooth, the remainder gradate and compressed at the sutures, smooth, closely ribbed, and spirally crossed by many revolving sulci, these being orange-dotted or lineated at the point of junction with the centre of each rib. Obscurely at the sutures, but very distinctly in the centre of the last whorl, run spiral fuscous zones; this latter shades off gradually towards the base; the aperture is oblong, fuscous; outer lip straight, crenulate in its lower part; columella tinged with ochre, four times plaited.

Allied to *M. infausta*, Reeve, from Ticao, and *M. fulvosulcata*, Melv., from Mauritius and Lifu. Neither of these species, however, has the fusiform contour nor any sign of the brown central fascia, though agreeing in the ochreous spiral sulci.

*Mitra (Costellaria) revelata*, sp. n.  
(Pl. II. figs. 3, 3 a.)

*M. testa* turriculata, fusiformi, albida, parum nitente, solidiuscula; anfractibus 10-11, apicalibus sæpe puniceo-tinctis, cæteris gradatulis, superne arcute longitudinaliter costatis, costis lævibus, obtusis, ultimo in anfractu, præcipue dorsaliter, plerumque fere evanidis, superficie longitudinaliter tenuiter brunneo-lineata, apud medium obscure brunneo-zonulata; apertura oblonga, alba; labro exteriori recto, crassiusculo; columella quadriplicata.

Long. 21, lat. 8 mm.

*Hab.* Sheik Shuaib Island, 7-20 fathoms, in sand and mud; in 10-15 fathoms off Kais (or Gais) Island, in shingle and dead coral, Persian Gulf.

A species apparently common, though local, in the Persian Gulf, and probably extending in both a southerly and eastward direction. It has hitherto been confounded with *M. pacifica*, Reeve, of which I possess an original type from the collection of the late Sir D. Barclay, Bart., the example figured in Sowb. Thes. Conch. t. cclxxviii. fig. 630, which exhibits a form more compressed, strongly shouldered, and angulate in the upper portion of each whorl, very rugose, and ribs fewer but more marked in proportion. I consider this latter species nearer to the variable *M. cadaverosa*, Reeve, so abundant in the Philippines, and especially the islands of the Pacific. *M. Wisemanni*, Dohrn, is in size nearer our shell, but the clearly defined and frequent longitudinal ribs, unvarying in all the specimens I have seen, amply distinguish it. I am much indebted to Mr. Sowerby for especially calling my attention to this hitherto neglected species.

*Erato olivaria*, sp. n. (Pl. I. fig. 9.)

*E.* testa arcuato-pyramidata, solida, læte olivacea, apice subconico; anfractibus quatuor, supernis interdum rugosulis, interdum lævibus, ultimo anfractu lævi, rapide accrescente, tumidulo, pyriformi, apud basim paullum attenuato; apertura angusta, oblonga; labro exteriore crassiusculo, denticulis quindecim intus prædito, margine columellari, et præcipue versus basim, incrasato, denticulato.

Long. 6, lat. 3.25 mm.

*Hab.* Karachi.

A few examples of a somewhat solid smoothish *Erato*, conspicuous for its bright olive hue; the apex is subconical; whorls four, the last being large, pyriform, somewhat attenuate at the base, the mouth narrowly oblong; outer lip thickened, denticulate within, with fifteen little teeth; columellar margin thickened, especially towards the base, and then also denticled. This species slightly resembles the European *E. lævis*, Donovan.

The only other known smooth species of a uniform green or olive hue is *E. prayensis*, Rochbrune, from the Cape Verd Islands, but, from description, would seem to differ both in form and lip-characters.

*Natica Ponsonbyi*, sp. n. (Pl. II. fig. 4.)

*N.* testa globosa, anguste sed profunde umbilicata, solida, lævi, paullum nitida, albida; anfractibus 4-5, apicali fere immerso, nigro, cæteris supra suturas castaneo-fasciatis, ultimo anfractu

binis fasciis decorato; apertura ovata; labro simplici, paullum incrassato; columella nitida, alba, callosa, apud umbilicum excavata; operculo læte concentrice sulcato.  
 Long. 17, lat. 16 mm. (sp. maj.).

*Hab.* Persian Gulf (*Ponsonby*, in Mus. Brit.); Karachi (*F. W. T.*).

Belonging to the typical—*Eunatica*—section of the genus, as characterized by the calcareous and more or less sulcate operculum, this species bears a superficial resemblance both in pattern and colour of fasciation to *N. spadicea*, Gmel., or *rufa*, Born, but is far more rotund and compact than either. The large example figured was not dredged by Mr. Townsend, all his specimens, though alike in other respects, being much smaller and probably not fully grown; but it was presented to our National Collection some years ago, with the locality "Persian Gulf," by Mr. John H. Ponsonby, to whom I have the great satisfaction of dedicating so interesting and beautiful a species.

*Scalaria (Cirsotrema) hidryma*\*, sp. n.  
 (Pl. I. fig. 10.)

*S.* testa attenuato-fusiformi, solidiuscula, ochraceo-fusca; anfractibus apud suturas impressis, fuscis, apicalibus?, cæteris, in numero septem, longitudinaliter crassicostatis, costis rectis, novem in ultimo et penultimo anfractu, spiraler spiraler undique leniter striatis, ultimo versus basim subangulato, incrassato, rugoso-lirato, fusciscente; apertura rotunda; peristomate continuo, percrasso, fusco, radiatim striato.

Long. 8, lat. 3 mm.

*Hab.* Karachi.

A well-marked *Cirsotrema* allied to *S. bicarinata*, Sowb., *attenuata*, Pease, and *crassilabrum*, Sowb.; perhaps most nearly to the last-named species, from which it differs in its sutures being not so deeply impressed, thicker and more conspicuous ribbing, much less angled more attenuate form, the continuous, fuscous, radiately striated peristome being similar.

*Scalaria (Constantia) Standeni*, sp. n.  
 (Pl. I. fig. 11.)

*S.* testa parva, fusiformi, fuscata; anfractibus octo, quorum tribus albis, vitreis, fere lævibus, cæteris ventricosis, apud suturas impressis, arcissime decussatis, interstitiis exacte quadratis, ultimi

\* *Ἰδρυμα*, a beautiful habitation.

anfractus costulis longitudinalibus circa duo et quadraginta, spiralibus octodecim; apertura rotunda; peristomate fere continuo, paulum incrassato, albescente.

Long. 4.50, lat. 2 mm.

*Hab.* Karachi.

A small but highly chased *Constantia*, of about the same dimensions as *jucunda*, Adams, from Corea, but with rounder peristome, eight instead of six whorls, and with last whorl more ventricose and not produced basally. The colour is fuscous; the three apical whorls are almost smooth, shining, vitreous, the remaining five all ventricose, impressed at the sutures, and very closely decussate, with many small longitudinal riblets, crossed spirally by others of the same nature and consistency, leaving minute quadrate interstices between them at the point of junction. The peristome is almost continuous, whitish, slightly incrassate, aperture round. Several examples, some of which (which have come to hand since the original description was framed) are lighter in colour but otherwise identical.

I do not consider *Constantia* more than subgeneric. I have much pleasure in associating this little shell with the name of Mr. Robert Standen, Assistant Curator of the Manchester Museum, who is about to collaborate with me in drawing up a complete catalogue of Mr. Townsend's large collections of Mollusca from the Indian Ocean.

*Actæopyramis Psyche*, sp. n. (Pl. I. fig. 13.)

*A.* testa attenuato-fusiformi, perlonga, tenui, subpellucida, albido-straminea; anfractibus decem, apud suturas gradatulis, apicali heterostropho, lævi, globulari, cæteris arcu sulcatis, sulcis pulchre punctulatis, ultimo anfractu fere recto, attenuato; apertura anguste ovata, labro tenui, margine columellari obscurissime uniplicato.

Long. 16.50, lat. 3.50 mm.

*Hab.* Karachi.

A most delicate semitranslucent shell, to which the specific name chosen seems very fitting. It is akin doubtless to *A. fulva*, better, perhaps, known as *Monoptygma fulva*, A. Ad.; but this name of Gray's (1840) must become a synonymn, as Lea had previously used it in 1835 for a subgenus of *Ancilla*, Lam. From this, however, it differs in several salient particulars—firstly, in the paler attenuation and straightness of whorl; secondly, in possessing two more whorls; thirdly, in the last whorl not being the least shouldered at the periphery; fourthly, in the whitish and

subpellucid consistency; and, lastly, in the close and fine punctuation of the interstices, *A. fulva*, Ad., having sulci quite plain and smooth throughout.

*Odostomia eutropia* \*, sp. n. (Pl. I. fig. 14.)

*O. testa* ovato-vel oblongo-fusiformi, candida, perlævi, nitida; anfractibus 6-7, apicali heterostropho, lacteo, bulbiformi, cæteris profunde ad suturas canaliculatis, paullum gradatis, nequaquam ventricosis, ultimo spiraliter ad peripheriam unicarinato, aliter lævissimo; apertura ovata, intus spirali-striata; labro vix, præter ad basim, incrassato; columella fortiter uniplicata.

Long. 5, lat. 2 mm. (sp. maj.).

„ 3, „ 1.25 mm. (sp. min.).

*Hab.* Karachi; also in mud at 25 fathoms, lat. 26° 23' N., long. 54° 53' E.

Shell either ovate or oblong-fusiform, bright shining white; whorls six or seven, the apical being heterostrophous, milky white and bulbous; the remainder are deeply canaliculate at the sutures, slightly turreted, but not in the least swollen; the last whorl at the periphery is once sharply carinate (in one or two specimens the keel is not so plainly seen); the aperture is oval, within spirally striate, the outer lip is hardly thickened except towards the base, the columella being more strongly plaited.

This is the species mentioned (Proc. Mal. Soc. vol. ii. p. 113) as having been noticed at Bombay, and descriptions drawn up, when the specimens unfortunately got mislaid, naturally therefore precluding publication. Many examples have been found at Karachi by Mr. Townsend, showing some variety in both size and distinctness of peripheral carination. *O. carinata*, A. Ad. (Proc. Zool. Soc. 1873, pl. xxiii. fig. 4), has also occurred in the same locality; it is conspicuous for a thickening below the sutures, thus forming a double angle to each whorl. It does not seem a monstrosity.

*Pyrgulina epentromidea*, sp. n. (Pl. I. fig. 15.)

*P. testa* ovata, crystallina, tenui, apice heterostropho, pervitreo, lævi; anfractibus quinque, gradatis, apud suturas multum impressis, undique longitudinaliter costatis, costis delicatis, vitreis, interstitiis lævibus, ultimo anfractu costis ad basim imam conspicuis, labro tenui; apertura ovata, intus striatula; columella fortiter uniplicata.

Long. 2, lat. 1.30 mm.

\* εὐ, τροπίς, with conspicuous angle or keel.

*Hab.* At 25 fathoms, in mud, lat.  $26^{\circ} 23'$  N., long.  $54^{\circ} 53'$  E.

Remarkably delicate and subpellucid in form, this species, with the important exception of the strong columellar plait, recalls *Rissoina epentroma*, Melv. The interstices between the ribs are plain and smooth, in which respect it differs from most of its congeners. The apical whorl is heterostrophe, white, vitreous, smooth and bulbiform; the remaining four whorls are all uniformly delicately straight-ribbed, and are much impressed suturally, thus assuming a gradate appearance. The mouth is ovate, within spirally striate; columella with one central strong plait.

*Pyrgulina glycisma* \*, sp. n. (Pl. I. fig. 16.)

*P.* testa ovata, candida, compressa, apice globulari, lævi, heterostropho; anfractibus (apicalibus  $1\frac{1}{2}$  inclusis)  $6\frac{1}{2}$ , ad suturas impressis, paullum gradatis, longitudinaliter arcte obliquicostatis, costis lævibus, crassiusculis, nitidis, interstitiis delicate spiraler striatis, ultimo anfractu ad peripheriam spiraler profunde canaliculato et radiatim costulato; apertura ovata; labro simplici, paullum incrassato; columella uniplicata.

Long. 3, lat. 1.25 mm.

*Hab.* Karachi.

Only a few examples occurred of this small but characteristic species. Mingled with it, but both in far greater plenty, were two having a superficial resemblance to it, viz. *Pyrgulina callista*, Melv., which, originally described from Bombay †, attains at Karachi a far finer condition and size, and *Rissoina epentroma*, Melv., likewise first reported ‡ from the same place.

The shell is ovate, pure white, sometimes with a cinereous tinge; apical whorls  $1\frac{1}{2}$ , heterostrophe, smooth, globular; the remaining whorls, 5 in number, are uniformly closely obliquely ribbed, these being shining, smooth, and somewhat thickened, with the interstices spirally striate; the sutures are impressed, causing the spire to appear slightly gradate; the ribs of the last whorl amount to 24. Aperture is ovate, outer lip only slightly thickened, columella once plaited. At the periphery of the last whorl is a deep spiral channelled groove, with a revolving rib at its margin.

This species has as its nearest congeners *P. turbonilloides*,

\* γλύκισμα, a delicacy.

† Mem. Lit. & Phil. Soc. Manch. ser. 4, vol. vii. p. 9, pl. i. fig. 13 (1893).

‡ Proc. Mal. Soc. vol. ii. p. 110, pl. viii. fig. 23 (1896).

Brusina, from the Mediterranean, *P. monocycla*, A. Ad., from Japan, and *P. callista*, Melv., from the Indian Ocean. Very recently (1898) Prof. Ralph Tate has described *P. Mayii*\* from Tasmania, which by the figure must be close to, if not actually identical with, *P. callista*.

*Lacuna tenuistriata*, sp. n. (Pl. II. fig. 5.)

*L.* testa ovato-orbiculari, pallide straminea, versus apicem puniceo-suffusa, tenui, anguste umbilicata; anfractibus quatuor, apicali incluso subpapillari, lævi, tumidulis, apud suturas impressis, arcuissime spiraliter tenuistriatis, ultimo rapide accrescente, effuso; apertura lunari, labro exteriori tenui, paullum effuso; margine columellari apud basim crassiusculo, nitido, albo, apud umbilicum canaliculato.

Long. 15, lat. 10 mm.

*Hab.* Muscat, Persian Gulf, at 7 fathoms.

A most interesting addition to the genus, from the known species of which it differs in greater tenuity, ovate-orbicular form, flattened apex, lowest whorl roundly effuse, the whole surface being most closely and finely spirally striate. Mouth lunar; outer lip thin; columella slightly thickened towards the base, white, shining, canaliculately grooved in the region of the narrow umbilicus. *L. indica*, E. A. Smith, is the only other true *Lacuna* hitherto recorded from tropical seas.

*Priotrochus sepulchralis*, sp. n. (Pl. II. fig. 6.)

*P.* testa semiglobosa, anguste umbilicata, gradatula, solida, alba, ochraceo-straminea vel, rare, puniceo-variegata; anfractibus quinque, apicali acuminato, lævi, cæteris gradatis, spiraliter flo-costatis, costulis acutis, ultimo et penultimo infra suturas spiraliter angulatim coronatis; apertura obliqua, rotunda, intus arcte sulcata; labro exteriori effuso, crassiusculo; margine columellari incrassato, albo, nitente.

Alt. 11, lat. 10, diam. 10 mm.

*Hab.* Kais Island, 9 fathoms, coral-sand.

Several examples, some subfossil. Semiglobular in form, with turreted whorls, the last two possessing, just below the sutures, a spiral coronation of nodules; the apical whorl is smooth, the remainder being spirally acutely costulate to the base of the last whorl. The aperture is obliquely rounded, within sulcate; outer lip thick, somewhat effuse; columellar margin thickened, especially in the proximity of the narrow umbilicus.

\* Trans. Roy. Soc. S. Australia, 1898, p. 84, pl. iv. fig. 6.

*Mactrinula tryphera* \*, sp. n. (Pl. II. fig. 7.)

*M.* testa pertenui, subpellucida, lactea, late trigonali; umbonibus fere centralibus, prominulis, acutis; margine dorsali antice paululum excavato, deinde versus marginem ventralem leniter rotundato; postice breviter exteuso, longitudinaliter carinato; margine ventrali versus latus posticum sinuato, aliter fere recto; superficie externa omnino usque ad carinam posticam regulariter concentricè laminata; laminis circa sex et viginti, intus pagina pellucida, laminas externas exhibente; dentibus cardinalibus et lateralibus parvis, contiguis.

Alt. 14, lat. 22, diam. 7 mm.

*Hab.* Hinderabi Island, at 35 fathoms, mud.

Shell very thin, milky-vitreous, subpellucid, broadly trigonal, anteriorly slightly gaping; the umbones are almost central, inclining forwards, acute, and prominent; the anterior portion of the dorsal margin is excavate and at length gently rounding off towards the ventral margin. Posteriorly the margin (dorsal) is shortly extended, longitudinally once-carinate; the ventral margin is mostly straight, but sinuous where joined by the carina; the external surface of the shell is uniformly and regularly concentrically laminate, with the exception of the posterior space enclosed by the keel, which is smooth; the laminæ are some six-and-twenty in number, inclusive of those on the umbones, which are small and obscure. Within the surface is pellucid, showing through the external laminæ; the teeth, both cardinal and lateral, are small and near each other. Pallial sinus obscure, hardly perceptible.

This is a very beautiful and delicate little mollusk, having some resemblance to the larger and coarser *M. plicataria*, L.; but the form is more regularly trigonal, and the umbones more central, with the anterior dorsal margin less prominently excavate and the concentric laminæ closer and finer.

While discussing a member of the Mactracea, I should like to take the opportunity of stating that further examination of a species described by me as *Petricola lyra*, from Commander Shopland's Aden collections †, prompts one to the decision that it is really a *Standella* akin to *S. Solandri*, Gray. The Mactrids of this alliance have a strong superficial resemblance to *Petricolæ*, and the teeth of this new form were rather distorted and compressed, thus causing

\* τρύφερος, delicate.

† Ann. & Mag. Nat. Hist. ser. 7, vol. i. p. 204.

confusion. It has been placed by Mr. Edgar Smith in the National Collection as *Standella lyra*, Melv., in direct sequence with *S. Solandri*, Gray.

*Lucina (Codakia) angela*, sp. n.

(Pl. II. fig. 8.)

*L. testa parva, orbiculari, albo-calcarea, fere æquilaterali; umbonibus contiguis, prominulis, margine dorsali antice paullum excavato, deinde leniter rotundato per marginem ventralem usque ad latus posticum; superficie externa longitudinaliter tenuicostata; costis ad quinquaginta, delicate imbricatis, oblique arcuatis, concentricè irregulariter plicata; costis trans medium versus latus anticum pulchre divaricatis, ligamento vix externo; pagina interna subpellucente, albida, nitida; margine undique pulchre crenulato; dentibus in utraque valva cardinalibus, simul ac lateralibus, duobus; impressione palliali conspicua, haud sinuosa.*

Alt. 8, lat. 9, diam. 4 mm.

*Hab.* Gwador, on hard sandy mud, dredged at 8 fathoms.

Allied to *L. fibula*, Ad. & Rve., and *pecten*, Lam., this little species differs from both in form and the character of the divaricating ribs. The form is more truly orbicular and almost equilateral. The umbones are prominent, contiguous, and inclined anteriorly, on which side the dorsal margin is slightly excavate, but soon rounds off towards the ventral margin and forms an almost complete circle. The divaricating ribs are slightly beyond the centre of the surface and towards the anterior side; the total number of ribs is about fifty, they are close and finely imbricate; the shell is rudely and irregularly, here and there concentrically, plaited. Within, the surface is white, shining, subpellucid, the whole rounded margin is finely crenulate; each valve possesses two lateral and two cardinal teeth, and the pallial impression is entire and conspicuous. The ligament appears in part concealed by the valve-margin.

Several examples.

*Cryptodon victorialis*, sp. n. (Pl. II. figs. 9, 9 a.)

*C. testa delicata, albo-lactea, ovato-orbiculari, æquivalvi, paullum inæquilaterali, undique concentricè pulcherrime lamellata; lamellis teneris, arctis, apud umbones sæpe evanidis, in numero circa sexaginta; umbonibus contiguis, antice inversis, latere postico longitudinaliter obliquiplicato, antice lunula distincta ad marginem serrata, excavata; superficie sub lente hic illic pellucide punctata; dente cardinali valvæ dextræ magno, conspicuo; pagina intus lactea, vix nitente, punctis pellucidis nitidis et striis longitudinalibus notata; linea palliali completa.*

Alt. 24, lat. 24, diam. 14 (sp. maj.).

*Hab.* Near Karachi and also Malcolm Inlet, Persian Gulf, 24 fathoms.

A remarkably delicate, semitransparent, milky-white shell, slightly inæquilateral, entirely concentrically laminated with about sixty close-lying ridges; these are very thin and worn off, as a rule, towards the umbones; these last are contiguous, curving anteriorly; there is a longitudinal oblique conspicuous fold or groove, extending posteriorly from the umbo to the hinder extremity, and likewise in front; a distinct lunule; the dorsal margin of the shell is serrate or fimbriolate; in juvenile examples the lamellæ are more sparse and distant, but the serrations are conspicuous and seem to extend far down both sides almost to the ventral margin. As is the case with several allies, e. g. *L. pennsylvanica*, L., *L. jamaicensis*, Lamk., small pellucid raised dots are noticeable with a lens on holding up a specimen to the light.

Several examples, but mostly single valves, only one being quite perfect, and that in young condition, with fewer concentric lamellæ (fig. 9 a).

*Diplodonta holosphæra* \*, sp. n. (Pl. II. fig. 11.)

*D.* testa rotundato-circulari, alba, parum nitida, plana, tumida, æquivalvi, ut proxime æquilaterali; umbonibus contiguis, margine dorsali antice paullulum excavato, postice leniter obliquo, deinde omnino rotundato, ligamento externo; valva sinistra duobus dentibus cardinalibus approximatis, dextra duobus, postico bifido; superficie intus alba, pellucente; linea palliali simplici.

Alt. 8, lat. 8·50, diam. 7·50 mm.

*Hab.* At very low tides, Karachi; also imbedded in rocks at 40 fathoms, lat. 27° N., long. 52° E., Persian Gulf.

A few examples of an almost circular spheroid *Diplodonta*; valves as nearly as possible equilateral, the umbones contiguous, ligament external, margin on either side of the umbones very slightly excavate anteriorly, obliquely straight posteriorly for a short distance, then completely round; the body of the shell very tumid; there are in either valve two teeth, those of the left valve are closely approximate, the pallial line being simple.

*Scintilla callipareia* †, sp. n. (Pl. II. fig. 10.)

*S.* testa vitrea, delicata, oblongo-ovata, æquivalvi, semiclausula, fere æquilaterali, nitida, lævi, pallide rosea; umbonibus contiguis,

\* ὄλος, complete, σφαῖρα, a globe.

† καλλιπαρῆος, beautiful cheeked.

prominulis, margine dorsali utrinque fere æquali, leniter in ventralem immergente; ligamento interno, hujus valvæ dente cardinali conspicuo, prolongato, illæ duobus minoribus approximatis, dente laterali juxta cardinem abbreviato, pagina intus translucida; impressione palliali integra.

Alt. 9, lat. 14, diam. 4.50 mm.

*Hab.* Telegraph-cable, lat. 27° N., long. 52° E., at 40 fathoms, Persian Gulf.

A very delicate mollusk, allied to *S. rosea*, Desh. It is very translucent, shining, of the palest blush reflection, oblong-ovate in form, equivalve and almost equilateral, and quite smooth. The umbones are fairly prominent, close together; dorsal margin continuous, and almost equal posteriorly and anteriorly, gently merging into the ventral margin. Valves almost closed in repose; the ligament is internal, the cardinal tooth prolonged and conspicuous, the fellow valve possessing two smaller teeth; the lateral tooth is short, placed near the hinge; the inner surface being plain, transparent; pallial impression entire.

? *Ædalina asiatica*, sp. n. (Pl. II. fig. 12.)

*Æ.* testa delicatula, nitida, alba, æquivalvi, inæquilaterali; umbonibus prominulis, contiguis; margine dorsali antice paullum excavato, deinde leniter rotundato ad marginem ventralem, latere postico paullum producto, oblongato; superficie nitida, hic illic depressiuscula, concentricè rudistriata; ligamento externo; dentibus dextræ valvæ tribus, sinistræ duobus cardinalibus, haud tamen bifidis, lateralibus nullis; pagina interna subpellucida; linea palliali multum sinuosa.

Alt. 12, lat. 16, diam. 8 mm. (sp. maj.).

*Hab.* Muscat, at 10 fathoms; also smaller examples at Charbar, Mekran coast, at 3-7 fathoms.

I feel some doubt as to the correct generic designation for this shell. It is in shape externally much like *Ædalina subdiaphana*, Carp., from California, and Mr. Edgar Smith suggested in consequence that it might be possibly located with it. The teeth, very small and difficult to pronounce upon, seem to agree to a great extent with those of the western *Ædalina*, but I do not notice that any of them are bifid. Carpenter separated *Cooperella* from *Ædalina* on account of this peculiarity alone. If this species be an *Ædalina*, it would tend to show greater affinity with the Scrobicularineæ than the Tellinidæ, the texture of the shell, though thin, being coarse, here and there irregularly depressed and roughly concentrically striate. It is equivalve,

inæquilateral, umbones prominent, oblong in form, being somewhat produced posteriorly; the ligament is external; teeth in right valve apparently three, in the left two, all cardinal; inner surface subpellucid, white; pallial line with a conspicuous sinuosity.

Several examples, but only a very few in mature condition.

## EXPLANATION OF THE PLATES.

## PLATE I.

- Fig. 1. *Nassa (Hima) ischna*.  
 Fig. 2. *Drillia theoreta*.  
 Fig. 3. *Mangilia chilosema*.  
 Fig. 4. — *galigensis*.  
 Fig. 5. — *perlonga*.  
 Fig. 6. — *theskeloides*.  
 Fig. 7. *Clathurella O'Maleyi*.  
 Fig. 8. *Lutirus (Peristernia) pagodæformis*.  
 Fig. 9. *Erato olivaria*.  
 Fig. 10. *Scalaria (Cirsotrema) hidryma*.  
 Fig. 11. — (*Constantia*) *Standeni*.  
 Fig. 12. *Cerithiopsis (Scila) bandorensis*, Melv.  
 Fig. 13. *Actæopyramis Psyche*.  
 Fig. 14. *Odostomia eutropia*.  
 Fig. 15. *Pyrgulina epentromidea*.  
 Fig. 16. — *glycisma*.

## PLATE II.

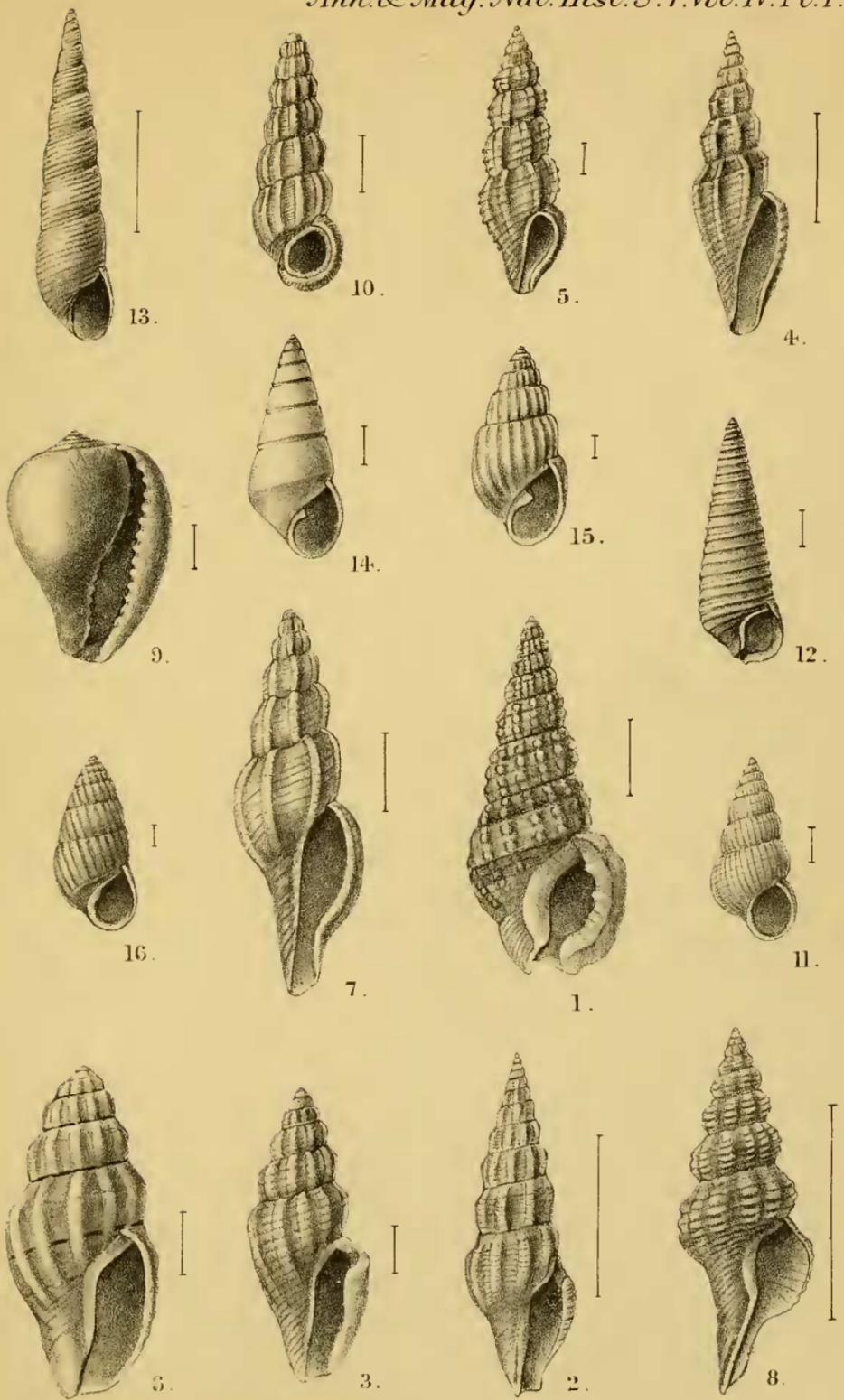
- Fig. 1. *Fusus Townsendi*.  
 Fig. 2. *Mitra (Pusia) Elizæ*.  
 Figs. 3, 3 a. *Mitra (Costellaria) revelata*.  
 Fig. 4. *Natica Ponsomyi*.  
 Fig. 5. *Lacuna tenuistriata*.  
 Fig. 6. *Priotrochus sepulchralis*.  
 Fig. 7. *Macrinula tryphera*.  
 Fig. 8. *Lucina (Codakia) angela*.  
 Figs. 9, 9 a. *Cryptodon victorialis*.  
 Fig. 10. *Scintilla calliparcia*.  
 Fig. 11. *Diplodonta holosphæra*.  
 Fig. 12. ? *Ædulina asiatica*.

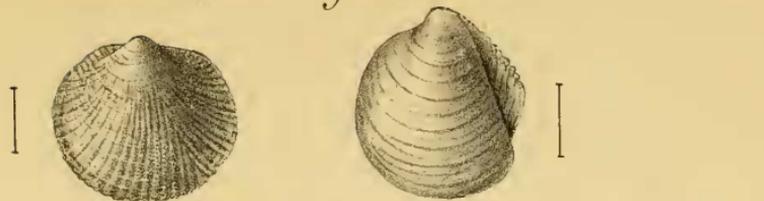
## VI.—Observations on the Classification of Birds.

By Dr. R. W. SHUFELDT\*.

IN former papers of mine the classification of various groups of birds has been treated, their osteology, as a rule, being the anatomical system employed and referred to for the purpose.

\* From the 'Proceedings of the Academy of Natural Sciences of Philadelphia,' 1898, pp. 489-499. Read by title at the Sixteenth Congress of the American Ornithologists' Union, at the United States National Museum, Washington, D.C., 17th November, 1898.



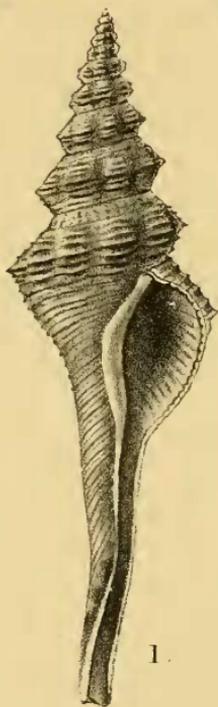


8.

9a.



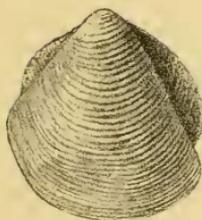
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1.



11.



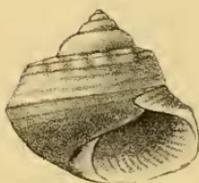
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10.



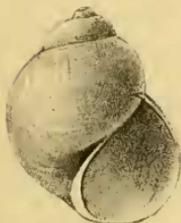
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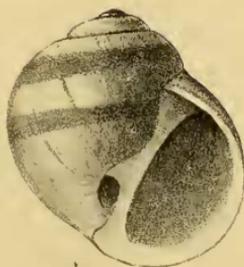
6.



2.



5.



4.



3.



3a.